Looking at Black Sea Microbial Communities to Understand Ancient Oceans

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Earth's oceans would have appeared foreign to the modern observer for much of our planet's history, as evidence shows that the oceans had oxic surface and anoxic deep layers from approximately 2 to 0.5 billion years ago. This is much like the current Black Sea, the world's largest anoxic basin. We are investigating anaerobic bacterial communities of the Black Sea in order to better understand the ancient oceans. We are particularly interested in novel metabolisms, such as anaerobic ammonium oxidizing (anammox) bacteria, chemoautotrophs which can release significant amounts of N_2 gas.

Using samples collected from various depth horizons focused on the suboxic zone of the Black Sea's central gyre, we have constructed and sequenced 16S rDNA clone libraries using Planctomycetes-specific primers. This has allowed us to look at diversity within the Planctomycetes group, with several interesting results. Among the many sequences which do not fall into previously defined genera, one particularly interesting group of 16S rDNA environmental sequences (detected only with Planctomycetes primers) branches separately from known groups and is also found growing in a selective culture for anammox bacteria. Additionally there are several other environmental sequences similar to bacteria known to carry out the anammox process. This raises interesting questions about the genetic diversity and metabolism of the Planctomycetes in general and anammox bacteria in particular. It also leads us to believe that there is much yet unknown about the composition of early marine microbial communities, as well as their interactions with and contributions to the planetary environment.